



INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification ⁴ : B26F 1/00		(11) International Publication Number: WO 85/01241 (43) International Publication Date: 28 March 1985 (28.03.85)
<p>(21) International Application Number: PCT/DK84/00089</p> <p>(22) International Filing Date: 14 September 1984 (14.09.84)</p> <p>(31) Priority Application Number: 4235/83</p> <p>(32) Priority Date: 16 September 1983 (16.09.83)</p> <p>(33) Priority Country: DK</p> <p>(71) Applicant (for all designated States except US): TEKNOLOGISK INSTITUT [DK/DK]; Gregersensvej, DK-2630 Tåstrup (DK).</p> <p>(72) Inventor; and</p> <p>(75) Inventor/Applicant (for US only) : BORGQUIST, Niels, Erik [DK/DK]; Christian G. Borgquist & Co., Korsdalsvej 127, DK-2610 Rødovre (DK).</p> <p>(74) Agent: LARSEN & BIRKEHOLM A/S SKANDINAVISK PATENTBUREAU ; Niels Hemmingsens Gade 32, DK-1153 København K (DK).</p>		<p>(81) Designated States: AT (European patent), BE (European patent), CH, CH (European patent), DE, DE (Auxiliary utility model), DE (European patent), FR (European patent), GB, GB (European patent), LU (European patent), NL (European patent), SE, SE (European patent), US.</p> <p>Published With international search report. In English translation (filed in Danish).</p>
<p>(54) Title: METHOD AND TOOL FOR PUNCHING HOLES</p> <p>(57) Abstract</p> <p>When punching holes and objects (12), respectively, in non-metallic sheet-like material, a hitherto unknown quality and working speed can be achieved by letting a cutting tool (10, 13) from either the top side and/or the under side of the material (1) press in to a point leaving a non-cut ring of a thickness of eg. 0.01 mm. The material (12) can then be removed from the surrounding material (1) either by means of a generally known pressing-out tool or for instance by means of the compressed air inlet while the cutting tool (10, 13) is in the skin (1) or after its removal. For operating the cutting edges (10, 13) these may be mounted on a top and a bottom linear motor (4, 2 and 14, 15) which may furthermore control the pressing-out means (11). This will permit a fully automatic control of the tools.</p>		

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1 METHOD AND TOOL FOR PUNCHING HOLES

5 The invention relates to a method for punching holes in non-metallic sheet-like materials and a punching tool for performing the method.

When making objects in eg. skin and leather, a punching tool with an annular cutting edge the size and shape of which correspond to the outer shape and the shape of the hole, respectively, of the end product is generally used. This cutting tool is either manually or mechanically pressed through the material from 15 one side and towards an underlying backstop, a so-called punching plate.

After the punching the tool is withdrawn leaving a hole the cut object being wedged in the cutting edge from 20 where it may be subsequently pressed out.

This known method does not give the object and the hole, respectively, a cutting surface which is at right angles to the surface because the cutting edge must 25 have a certain bevelling or free edge to avoid being jammed in the material. The bevelling side faces are particularly inconvenient for thick materials and a subsequent trimming is often required for obtaining a straight side face which is substantially at right 30 angles to the surface.

It is moreover necessary to have a punching plate which must be moved for each punch and also must be replaced after abt. 25 punches. This is highly time



1 consuming and increases costs for the whole method.

For remediying these drawbacks as much as possible, the cutting tool must have the smallest possible wall thickness which will reduce the tool's strength and so its life at the same time while the requirements to the nature of the punching plate are increased.

Add to this that such an object and hole, respectively, will often have burrs on one side namely the underside which will also require a subsequent trimming if such remnants of material are to be removed for being trimmed on both sides.

15 To sum up it may be established that particularly in connection with heavy materials a finishing is required where a perpendicular clean cut with uniform edges on both sides of the object and the hole, respectively, is desired.

20

If by using the usual methods with punching tool and plate, there are to be made objects or holes in eg. skins having been treated in solid or liquid composition salt or having been softened in liquids, this 25 will give both technical and hygienic problems.

It is the object of the invention to remedy these drawbacks by the known methods and this is achieved by a method where from the top side and under side, 30 respectively, of the material a cutting tool is pressed through the material until the cutting edges almost touch whereupon the cut out material is removed in a manner known per se by pressing out. The result is first and foremost that the opposite cutting



1 tools are evenly pressed in to a point around the
middle of the material. This will mean an optimum
utilization of the pressing power and will at the
same time halve the cutting depth of the individual
5 cutting edges. Furthermore, the cut will be clean
since burrs will not so easily occur due to the
effective counter-pressure in the material.

10 The cut objects and holes, respectively, will moreover
be uniform on both sides just as the cut side edges
will be substantially at right angles to the surface
so that the trimming process can be completely avoid-
ed. Advantages in relation to time consumption and
work are therefore obtained. This method will leave
15 almost no burr and if any it will be situated in the
middle of the object and so rarely cause any incon-
venience.

20 Add to this that it is a very careful method because
the cutting edges are not pressed into a backstop so
that these edges are spared and their life therefore
substantially increased.

25 Finally, it is often advantageous that the pressed out
object can be subsequently removed since the object
will be left hanging in the non-cut ring in the middle
of the material so that the object or objects can be
removed from the material at a later time. In that way
it is possible to make preparations for the pressing
30 out of eg. a number of holes at a later date according
to requirements just as it will be possible to adapt
objects/holes by a suitable punching pattern.

By using the method disclosed in claim 2 where the



1 object is removed by pressing out while the tool is in the material, a substantially completely clean cut is obtained since any burrs will be cut off when passing one of the cutting edges.

5

By using the tool disclosed in claim 3 with cutting edges being reciprocated from the top and/or under side, it is possible to carry out a mechanical punching in a simple and economic manner.

10

Finally, it is advantageous to provide one of the cutting edges with a pressing-out means as disclosed in claim 4, since it is possible to press out the object of the material when the cutting edges are in the material. By suitable removal means the object or objects can be removed from the working point in an effective and careful manner.

The invention will be further described in the following with reference to the drawing, wherein

20

Fig. 1 shows the cutting tool pressed into the material, and

Fig. 2 shows the tool with the pressing-out means in its forward position.

25

The drawing shows an example of the method according to the invention where the punching tool is mounted in two holders 18 and 19 which may be secured to a not shown bracket. For small tools the holders may be manually operated.

In these two holders there are mounted two sets of cutting tools comprising the cutting edges 10, 13



1 proper. In the shown embodiment there are two circular cutting edges which can therefore punch a circular hole and an object having the shape of a circular disc 12 in a piece of material 1 being eg. skin or leather.

5

10 The cutting tools are each secured to a support connected to a piston 4, 14 in a working cylinder 2, 15. By a suitable admission of pressure medium such as air or liquid through pipes 8, 17, the cutting tools may be pressed into the leather 1 to a point, see Fig. 1, where the cutting edges almost meet by the centre inside the leather. At this point the cylinders 4, 14 will impinge on the cylinder bottom and prevent further progression.

15

15 At this time there is formed a circular groove on both sides of the leather for forming a disc 12 which merely hangs on to the surrounding leather by a ring having a thickness of eg. between 0.01 and 0.02 mm.

20

20 By means of a pressing out piston 11 being rigidly connected to a further piston 3 in an overlying cylinder, the piston may be carried towards to disc 12, as shown in Fig. 2, by admission of the pressure medium to the cylinder via a pipe 6. The pressure medium is then fed to the opposite sides of the pistons via other pipes 9, 16, and the pistons 4, 14 move backwards and so out of the leather.

30 30 In this manner the disc 12 may be pressed out and removed from the leather and if desired be collected in a container or the like by means of not shown guide means. The disc may be pressed out by means of compressed air and the shown pressing-out device may

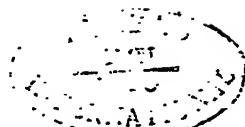


- 1 be left out. The whole method can be controlled fully automatically so that the punching is effected quickly and precisely.
- 5 Instead of the shown moving devices in the form of working cylinders any other known form of working motors may be used. For instance the returning of the cutting tools may take place by means of spring power from springs mounted between cylinder bottom and
- 10 piston. Alternatively, electromagnetic motors may be used for moving the cutting edges either in both directions or in one direction and as mentioned above returning by means of springs.
- 15 Moreover the movements may be performed by an electric motor moving the tools in a similar manner by means of suitable cam discs via arms.

Where the punching of eg. a row of holes is required, 20 a corresponding number of tools may be secured in a common holder with the possibility of a selective actuation of the tool or tools forming the prefixed hole pattern.

- 25 The present specification merely mentions skins and leather but the method may advantageously be used for making objects and/or holes in veneer, plastic, cork, packing material, paper, cardboard, textiles, rubber. The method is particularly suitable for long-fibre
- 30 materials which have hitherto caused problems by previously known punching tools.

Finally, the method and the tool are suitable for working materials which have been moistened by chemical liquids.



1

P A T E N T C L A I M S

1. Method for punching holes in non-metallic sheet-like materials, characterised in that
5 a cutting tool (10, 13) is pressed through the material from the top side and under side, respectively, of the material (1) until the cutting edges almost touch whereupon the cut out material (12) is removed in a manner known per se by pressing out.

10

2. Method according to claim 1, characterised in that the cut out material (12) is removed by pressing out through one of the cutting tools (10, 13) while these tools (10, 13) are in the material (1).

20 3. Punching tool for performing the method according to claims 1 and 2, characterised in that one or each of the cutting tools comprises a cutting edge (10, 13) mounted on a reciprocating device (4, 2 and 14, 15).

25 4. Punching tool according to claim 3, characterised in that one of the cutting edges (10) is furthermore provided with an internally embedded pressing-out means (11) which means is movable from a backward position (Fig. 1) in the tool to a forward position (Fig. 2) by means of a moving device (3, 2).

30



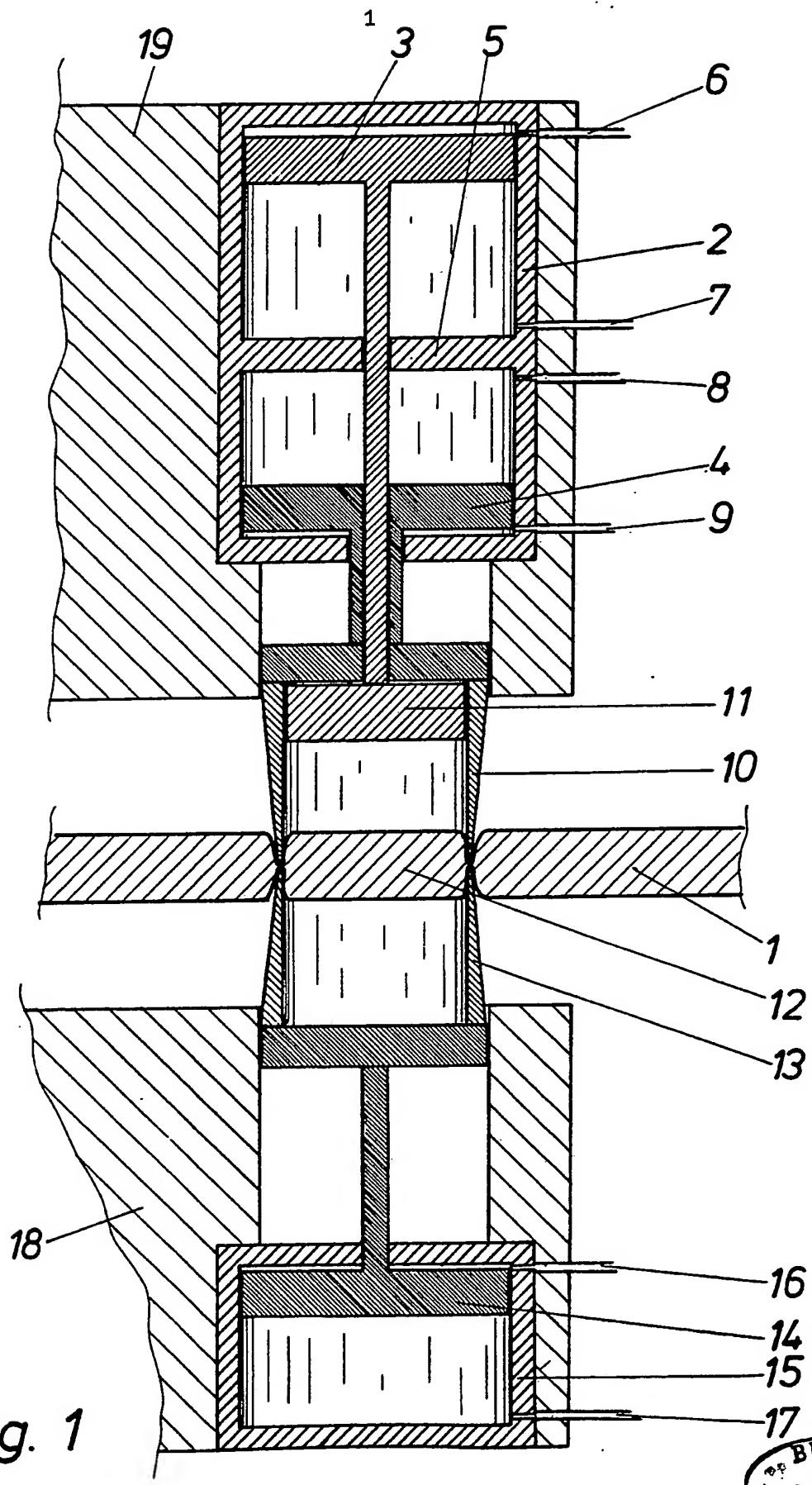


Fig. 1



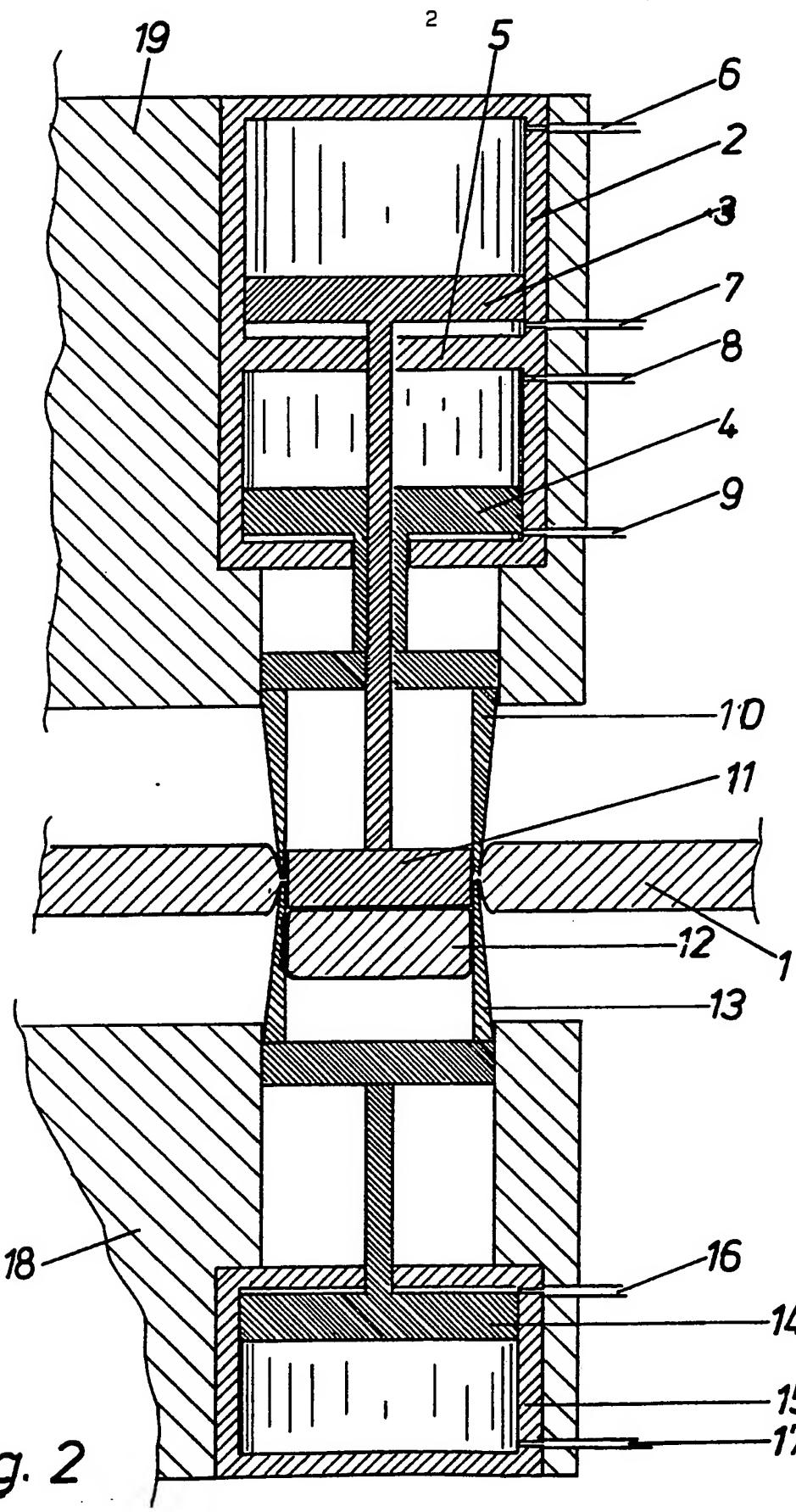


Fig. 2

INTERNATIONAL SEARCH REPORT

International Application No. PCT/DK84/00089

I. CLASSIFICATION OF SUBJECT MATTER (if several classification symbols apply, indicate all) ³

According to International Patent Classification (IPC) or to both National Classification and IPC ⁴

B 26 F 1/00

II. FIELDS SEARCHED

Minimum Documentation Searched ⁴

Classification System	Classification Symbols
IPC 4 Nat Cl US Cl	B 26 F 1/00-1/16; C 14 B 5,15 54d 2/01, 2/02, 3/01; 28b 11/01, 22/01 <u>69:2, 20, 21, 21.5, 48; 76:107; 83:652-657</u>

Documentation Searched other than Minimum Documentation
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III. DOCUMENTS CONSIDERED TO BE RELEVANT ¹⁴

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IV. CERTIFICATION

Date of the Actual Completion of the International Search ⁸

1984-11-26

Date of Mailing of this International Search Report ⁸

1984-11-29

International Searching Authority ⁹

Swedish Patent Office

Signature of Authorized Officer ¹⁰

Lars Engberg